

REMARKS

§ 132(a) Objection and § 112 Rejection

Claims 1-7 and 9-13 were objected to under § 132(a) on the basis that the amendments presented in the last Amendment introduced new matter. For similar reasons claims 1-7 and 9-13 were rejected under § 112 for failure to comply with the written description requirement. In particular, the Office Action asserted that there is no disclosure in the specification supporting the feature of electroplating the conductive material to a height *greater than* the upper surface of the conductive lead layer. The Office Action also asserted that there is no explicit mention of reflowing.

The applicant respectfully disagrees with the position that there is no disclosure of electroplating conductive material to a height greater than the upper surface of the conductive lead layer. Figure 6 and the associated description on pages 5 and 6 clearly show an embodiment of the invention having electroplated material 246 at a height greater than the height of the upper surface of the conductor layer 214. Withdrawal of the objection and rejection in connection with this claim feature is therefore requested.

The applicant also disagrees with the basis of the rejection for the no reflow feature. It is clear from the specification as a whole that the interconnect is formed without reflowing the plated material. Nonetheless, the claim language regarding this feature has been removed from the claim. Withdrawal of the objection and rejection in connection with this claim feature is therefore requested.

§ 103 Rejection of Claims 1-7 and 9-11

Claims 1-7 and 9-11 stand rejected under 35 U.S.C. § 103 as being unpatentable over the Cowles et al. U.S. Patent 6,700,748 in view of the Shangguan et al. U.S. Patent 6,082,610. Briefly, the Cowles patent is said to teach a method for forming an electrical interconnect on a suspension that includes the step of filling a masked via with plated solder. The Shangguan patent is said to teach an electroplating method to form an interconnection bump of copper and other metals between integrated circuit boards and integrated circuits. The position was taken that it would have been obvious to modify the method shown in the

Cowles patent by electroplating conductive material as taught by the Shangguan patent instead of using solder because electroplating allows the formation of a high density fine pitch interconnection.

The applicant respectfully disagrees with this position. The invention is a method for using an electroplating process to substantially form an electrical interconnect. The Cowles patent, on the other hand, uses a plating step only to deposit some solder in a via. Reflow of the solder is necessary to complete the ground path. The Cowles patent therefore discloses what is substantially a soldering process for creating an interconnect. Plating is used only as an initial step to deposit solder in the via.

By this response the applicant has amended claim 1 to more particularly point out and distinctly claim the invention, and to better distinguish the invention from the prior art of record. Specifically, claim 1 now recites that the electroplating step includes *filling the aperture in the insulating layer with the first conductive material*. This feature, in addition to the recited feature of building up the first conductive material to a height equal to or greater than the surface of the conductive lead layer, clearly distinguishes the use of a plating process to form the interconnect of the invention from the solder process, including incidental plating to initially coat the edges of the via with solder, of the Cowles patent.

Commenting on the applicant's response to a similar rejection in the previous Office Action, the Office Action states that if a different conductive material other than solder is deposited to form the interconnect, reflowing would not be required. This assertion, however, essentially presumes that the Cowles patent discloses an electroplating method for forming an interconnect. As noted above, this presumption is wrong. The Cowles patent discloses a *soldering* method to form an interconnect. Only with the aid of hindsight and the applicant's disclosure could the Cowles patent reasonably be construed to suggest an electroplating method to form an interconnect. Such a basis for supporting a claim rejection is clearly improper under the law.

The Office Action also states that the Cowles patent teaches in Figure 2 solder 312 and 308 that is formed to a height equal to or above the copper conductive layer. *But these are alternative embodiments* to the structure and process described in connection with the

“Plated Solder” illustration in Figure 2. Specifically, the solder 312 referenced in the Office Action is screen solder applied by a screen process, not a plating process. At column 3, lines 65-67, the Cowles patent states “[i]nstead of using a drop of conductive adhesive, plated solder 310 *or screen solder 312* can be used to connect” (emphasis added). Similarly, solder 308 of the Cowles patent is also apparently used in an embodiment that does not include any even incidental plating steps. As is described in the paragraph beginning at column 4, line 3, this embodiment of the connection has stepped-back edges 320 instead of a via, and solder 308 can be applied to hang over the stepped back edge. In short, these specific teachings of the Cowles patent have nothing whatsoever to do with a plated interconnect.

The Office Action also expresses disagreement with the applicant’s assertion in the response to the previous Office Action that there is no suggestion to combine the teachings of the Shangguan patent with the Cowles patent. The Office Action supports its position with the assertion that both patents teach forming an interconnect.

But this assertion does not address the fact that the Shangguan patent discloses electroplating only to form a bump 20 on a flip chip (one of the components to be interconnected) and to form a coating 24 on the pad 22 on the wiring board substrate 26 (the other component to which the flip chip is to be interconnected). (Shangguan patent, column 3, line 64 – column 4, line 2). *The “interconnect” between the flip chip bump and circuit board pad is formed by a direct chip bonding process that involves heating and reflowing the materials at the contact area between the bump and pad.* (Shangguan patent, column 4, lines 26-61). In short, the Shangguan patent discloses an electroplating process to form terminal bumps and terminal pads. There is no disclosure of any electroplating processes to create the interconnect between the bump and pad.

The Cowles and Shangguan patents do not even disclose plated interconnects. Instead, they disclose soldered and direct bond interconnects. The plating steps used in the processes shown in the patents are ancillary to the soldering and direct bond interconnect forming processes. Unlike the

claimed invention, these references do not suggest an electroplating method for building up conductive material on a spring metal layer, and filling the aperture with the conductive material, to form a plated interconnect. Withdrawal of the § 103 rejection of claims 1-7 and 9-11 is requested.

§ 103 Rejection of Claims 12 and 13

Claims 12 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over the Cowles and Shangguan patents, and further in view of the Gay U.S. Patent 4,764,260. The Gay patent is said to teach a method for anodic cleaning a stainless steel substrate. The position was taken that it would have been obvious to modify the Cowles and Shangguan method by removing oxide as shown by the Gay patent before electroplating.

These claims, however, depend directly or indirectly from claim 1, and have features and advantages that are neither taught nor suggested by the references of record. Withdrawal of the rejection of these claims is therefore requested.


Conclusion

By the amendments made herein and for the reasons presented above, all pending claims 1-7 and 9-13 are now in condition for allowance. Notice to that effect is respectfully requested.

Respectfully submitted,

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